

WHAT IS CLAIMED IS:

1. An optical module, to which an optical plug provided at one end of an optical transmission path is attached, so as to transmit and receive signal light via the optical transmission path for information communication, comprising:

a transparent substrate having light transmittance properties with respect to a wavelength of a signal light;

an optical socket, which is arranged on one surface side of the transparent substrate and to which the optical plug is attached;

an optical element, which is arranged on another surface side of the transparent substrate and emits the signal light to the one surface side of the transparent substrate according to a supplied electrical signal, or generates an electrical signal according to the intensity of the signal light supplied from the one surface side of the transparent substrate; and

a reflective portion, which is arranged on the one surface side of the transparent substrate and changes a path of the signal light emitted from the optical element at substantially 90 degrees to guide the signal light to the optical transmission path, or changes a path of the signal light emitted from the optical transmission path at substantially 90 degrees to guide the signal light to the optical element.

2. The optical module according to claim 1, the reflective portion being formed in the optical socket.

3. The optical module according to claim 1, further comprising:
a first lens, which converges the signal light emitted from the optical element to guide the signal light to the reflective portion, or converges the signal light, emitted from the optical transmission path and reflected by the reflective portion, to guide the signal light to the optical element.

4. The optical module according to claim 3, the first lens being formed in the optical socket.

5. The optical module according to claim 3, the first lens being formed on the transparent substrate.

6. The optical module according to claim 3, further comprising:
a second lens, which converges the signal light, emitted from the optical element and reflected by the reflective portion, to guide the signal light to the optical transmission path, or converges the signal light emitted from the optical transmission path to guide the signal light to the reflective portion.

7. The optical module according to claim 6, the second lens being formed in the optical plug.

8. The optical module according to claim 6, the second lens being formed in the optical socket.

9. The optical module according to claim 6, the first lens converging the signal light emitted from the optical element into substantially parallel light and the second lens converging the signal light emitted to the optical transmission path into substantially parallel light.

10. The optical module according to claim 1, the optical socket having guide surfaces to position the optical plug.

11. The optical module according to claim 10, the guide surfaces include two surfaces substantially parallel to each other and substantially orthogonal to the other surface of the transparent substrate.

12. The optical module according to claim 11, further comprising:
a pressing device to press the optical plug to the other surface side of the transparent substrate.

13. The optical module according to claim 10, the guide surfaces include two surfaces substantially parallel to each other and substantially orthogonal to the other surface of the transparent substrate, and one surface substantially parallel to the other surface of the transparent substrate.

14. The optical module according to claim 10, the guide surfaces include two surfaces substantially orthogonal to each other and arranged at an angle of substantially 45 degrees with respect to the other surface of the transparent substrate.

15. The optical module according to claim 14, each of the two surfaces having a projection portion to bias the optical plug.

16. The optical module according to claim 1, further comprising:
a locking device to hold a state, in which the optical plug is fitted into the optical socket.

17. The optical module according to claim 1, the optical socket having a guide groove to position the optical plug.

18. The optical module according to claim 17, the guide groove includes a surface substantially parallel to the one surface of the transparent substrate and surfaces substantially orthogonal to the one surface and penetrates from one end of the optical socket to the other end of the optical socket.

19. A manufacturing method of an optical module, comprising:
 - forming a wiring layer in a plurality of regions on one surface of a transparent substrate having light transmittance properties;
 - arranging an optical element on another surface of the transparent substrate corresponding to each wiring layer;
 - mounting an optical coupling component corresponding to each optical element on the one surface of the transparent substrate ; and
 - cutting and dividing the transparent substrate into the plurality of regions.
20. An optical communication device, comprising:
 - the optical module according to claim 1.
21. An opto-electrical hybrid integrated circuit, comprising:
 - the optical module according to claim 1.
22. A circuit board, comprising:
 - the optical module according to claim 1.
23. An electronic apparatus, comprising:
 - the optical module according to claim 1.
24. A plug, comprising:
 - first guide surfaces to position an optical fiber,
 - second surfaces to position a socket,
 - a second lens,
 - an optical axis of the lens substantially coinciding with a center of core of the optical fiber.
25. The plug according to claim 24, the plug being integrally formed.